Environmental Product Declaration

Italian Apples

ASSOMELA
ASSOCIAZIONE ITALIANA PRODUTTORI DI MELE

EPD®
ENVIRONMENTAL PRODUCT DECLARATION

*** 4 POs of the 11 associated to Assomela**

Registration number
S-P-00369

Date of publication: 2012/11/08
Date of validity: 2024/01/21

Date of revision: 2020/12/14
Version: 9

CPC Code
013 Friuts and nut
Information related to
2019 harvest

Programme
The International EPD® System
www.environdec.com

Programme operator
EPD International AB

This EPD has been developed in accordance with ISO 14025.
An EPD should provide current information, and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

Assomela

Assomela is the Italian association of Producer Organizations (POs), representing **71% of the national apple production**.

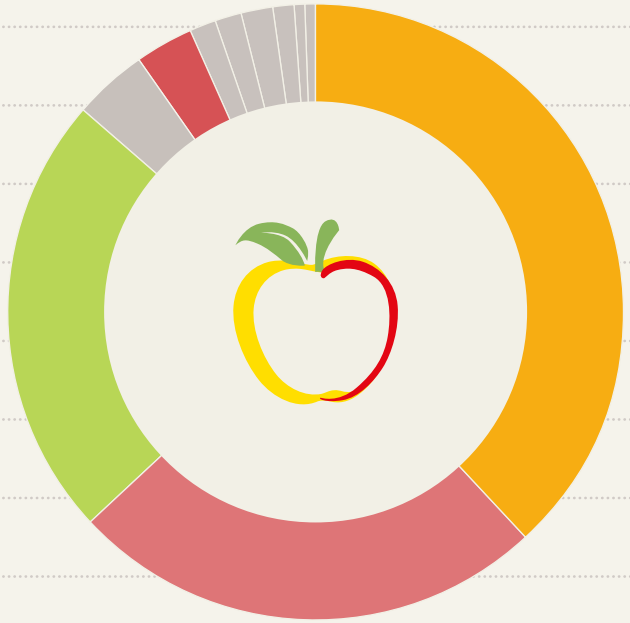
Assomela brings together POs **VOG** (Marlene), **VI.P** (Val Venosta) and **VOG Products** of the province of Bolzano, **Melinda**, **La Trentina** and **Mezzacorona** of the province of Trento, **NordEst** of the region Veneto, **Melapiù** of the region Emilia Romagna, **Rivoira** and **Lagnasco** of the region Piemonte, **Friulfruct** of the region Friuli Venezia Giulia and **Melavì** of the region Lombardia.

The mission of Assomela is the representation of associated producers' interests by coordinating and realizing research projects of common interest.

PERCENTAGE OF THE POs ON THE ASSOMELA TOTAL PRODUCTION

This Environmental Product Declaration was performed by **4** of the 11 POs associated in Assomela (VOG, Melinda, VI.P and La Trentina), which represent almost **90% of total production** of the Association.

- **38%** VOG
- **25%** Melinda
- **23%** VI.P
- **4%** Rivoira
- **3%** La Trentina
- **1,5%** Mezzacorona
- **1,4%** OP NordEst
- **1,4%** Melavì
- **1,2%** Lagnasco
- **<1%** Melapiù
- **<1%** Friulfruct



Producers' organizations involved in the project

La Trentina (Trento)

La Trentina represents about **1,000 farms** that operate in Trentino. They are grouped together into **5 associated cooperatives**.
The annual production is about **55,000 tons** of apples, cultivated with kiwi, cherries and plums on around **1,300 hectares**.

www.latrentina.it

laTrentina
Buona come la sua terra.

Melinda (Cles)

The Melinda Consortium since 1989 has assembled **16 cooperatives** and **3,600 production units**.
Cooperatives are base in the Non and Sole and produce about **420,000 tons** a year on around **6,700 hectares**.

www.melinda.it

Melinda®
D.O.P. MELA VAL DI NON

VOG (Terlano)

VOG is the Consortium of fruit and vegetable Cooperatives from Alto Adige. It brings together **14 cooperatives** and **4,600 producers** on a surface of **11,000 hectares**. Annual crop is around **570,000 tons**.

www.vog.it

Marlene®

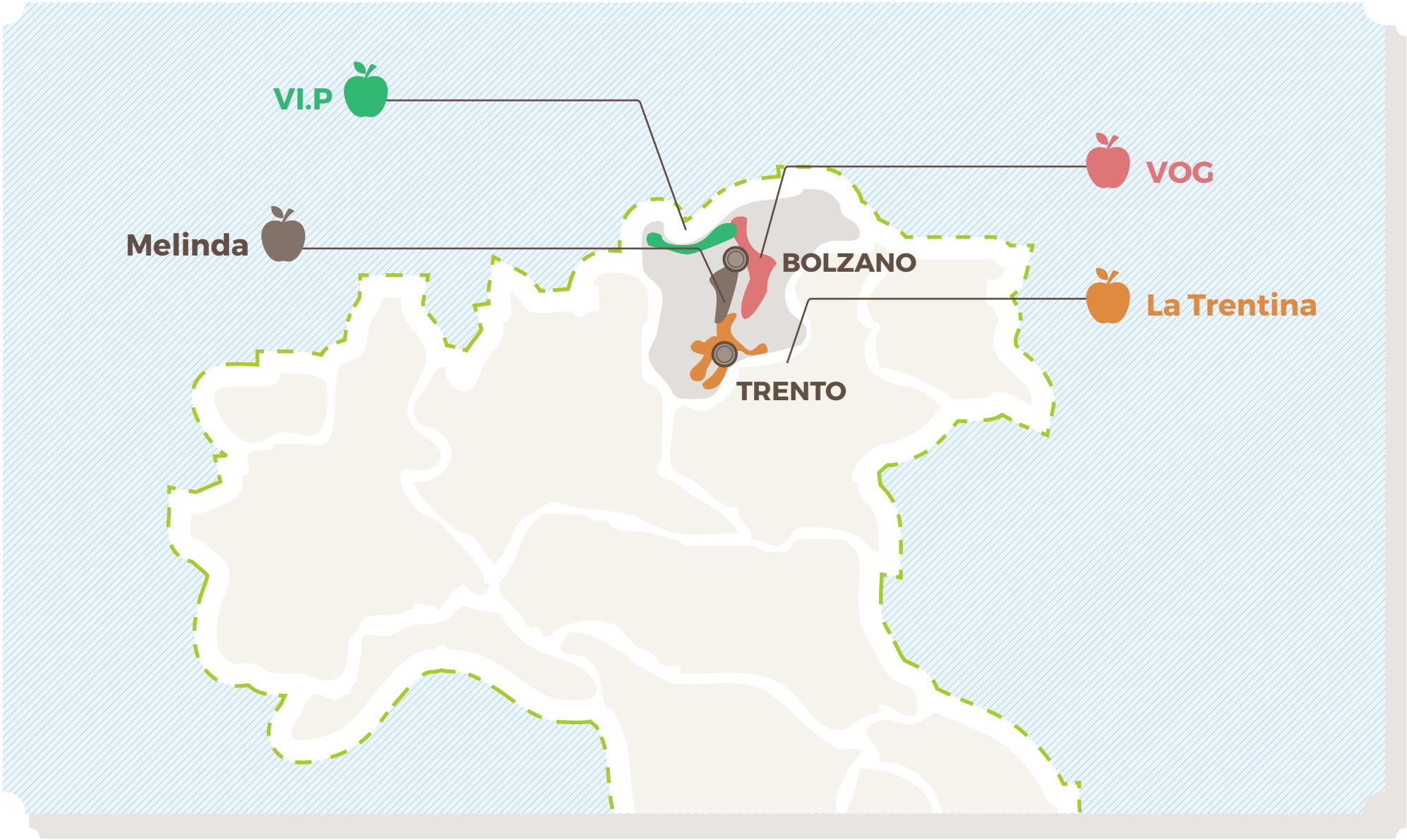
VI.P (Laces)

VI.P brings together **6 cooperatives** made up of **1,700 producers** from Val Venosta. On **5,000 hectares**, annual yield is about **330,000 tons** of apples.

www.vip.coop

VAL VENOSTA VINSCHGAU
Südtirol

The cultivation areas



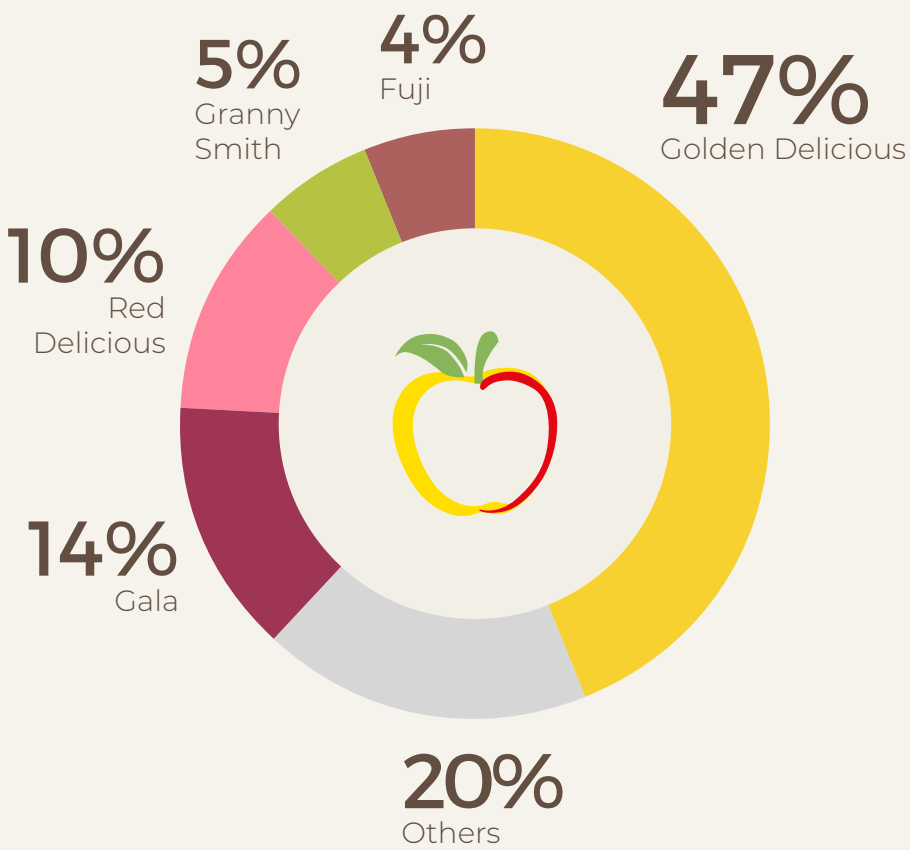
The apple

Apples are the fruit, more precisely false fruits, of the apple tree. The plant comes from **central Asia** and is present in Italy with around **2,000 nominal varieties**.It is hard to know how many varieties there are, in particular if we consider the historical superimposition of different denominations and all the extinct or untraceable species.

Even though the natural ripening is in the period between the **beginning of August and the beginning of November**, apples are available throughout the year thanks to conservation techniques. Conservation is possible in storage facilities where apples are maintained at low temperatures and at controlled atmosphere.
When requested by the market, apples are then withdrawn from these **storage plants** and taken to the **processing plants** in which they are sized, selected and packaged.

The apples we studied are cultiveted in the area analysed in this project. Varieties can differ for agronomic aspects, such as the **quantity of necessary feritlizers** and **yield**, but differences in the environmental impacts are not significative. For this reason, the resulting impact can be considered to be referring to an **"average apple"**. It is worth noting that the variety **Golden Delicious** is the most produced by the associated producers.

ASSOMELA APPLE – VARIETY



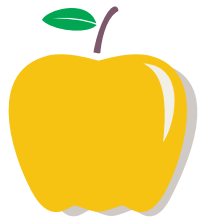
Functional unit

The data presented are referred to **1 kg of apples** sold unpacked. The apples subject of the declaration are intended for direct consumption. The shelf life varies from a few days to a few weeks, depending on the variety and on the temperature of the preservation environment.

Product contents

Apples contain many vitamins and minerals, especially **vitamin C** and **potassium**. They are rich in **pectin**, a food fiber very important for a good digestion and for an extended sensation of satiety.

They contain **flavonoids**, which have a positive effectv on the immune system, are anti-inflammatory and may reduce the risk in contracting some kind of cancer. Shown below the detail of apples' nutritional properties.

ENERGY VALUE	ELEMENTS	MINERALS	VITAMINS
Energy – 53 kcal	Water – 82.5 g	Potassium – 125 mg	Vitamin A – 8 µg
	Proteins – 0.3 g	Phosphorus – 12 mg	Vitamin B1 – 0.02 mg
	Fat – 0.1 g	Calcium – 7 mg	Vitamin B2 – 0.02 mg
	Carbohydrates – 13.7 g	Sodium – 2 mg	Vitamin C – 6 mg
	Food fibers – 2 g	Iron – 0.3 mg	Niacin – 0.3 mg

The methodology for the calculation

The data presented in this environmental declaration were calculated by analyzing the impacts of the activities carried out during all the phases from the **orchard** to the **product distribution** to the consumer. The nursery phase has not been considered since the average orchard duration may exceed 25 years and thus the impacts of this phase can be considered negligible. This aspect is coherent according to the PCR (Par. 4.3.1.1).

This EPD refers to the average values for the 2019 harvest:

Agricultural phase: 01/01/2019 - 31/10/2019
Production process phase: 01/08/2019 - 31/07/2020

PHASES OF APPLES PRODUCTION

UPSTREAM

> Production of raw materials, fuel and energy inputs
> Consumption of water resources
> Waste related to the agricultural phase

CORE

> Emissions related to the use of diesel, fertilizer and agricultural chemicals during the farming phase
> Emissions related to the use of fuels during the plant phase
> Production of packaging

DOWNSTREAM

> Distribution
> Packaging End of Life

FARMING

All the activities carried out between the end of an apple picking season and the beginning of the next one are part of this phase.
The main environmental factors concern oil use and water consumption, together with the use of pesticides and fertilizers.

PLANT

Storage

After the harvest, apples are immediately left in storage cells in controlled atmosphere, where they stay untill put on the market. The main environmental impact is the consumption of electric energy.

Processing

Processing is the phase of the selection, washing and packing of the apples requested by the consumers. Electric energy and water are the impacts of this phase.

PACKAGING

The packing phase occurs right after the processing phase. It refers to the production and the use of packaging materials.

DISTRIBUTION

The distribution happens both in Italy and abroad, and it principally consists for most in land transport by truck and for a small percentage in sea transport by ship.

Main hypotheses taken into account

CULTIVATION

Consumption of water and diesel oil were estimated from four POs according to the real consumption of the sample of farms. Data on other consumption (fertilizers and pesticides) have been obtained by the production specifications of the areas interested and then validated with specific information. The data about yields were evaluated according to the average age of the crops and the production volume. The data about produced waste were collected by APOT, the fruit and vegetable organization of Trentino. The land use change was not included in the calculation since almost all the orchards are in the areas subject of the study for over 20 years.

PLANT

Storage

The electric energy consumption has been estimated by dividing the total storages' consumption by the quantity of stored apples. The average value has been calculated as described in the section referring to the calculation of the means.

Processing

In this phase electric energy consumptions, water consumption and waste production have been considered. The data gathered from a sample plants were elaborated as indicated.

PACKAGING END OF LIFE

The end of life of packging primary was assessed as an average scenario of waste disposal compostable in Italy.

USAGE

It is supposed that domestic preservation happens at room temperature. Scraps due to the possible non edible part were not considered.

DISTRIBUTION

The impacts referred to the transportation phase have been calculated by supposing a transport of 970 km by truck and 400 km by ship, because in addition to the Italian and European markets, the distribution also concerned overseas, Asian and North African markets.

PACKAGING

The presented data refer to the selling of unpacked apples and considering the use of one biodegradable and compostable bag for 1 kg of apples. However, other packaging possibilities are presented.

The environmental impacts

ENVIRONMENTAL IMPACT INDICATORS		UNIT OF MEASURE	UPSTREAM		CORE			DOWNSTREAM		TOTAL
			Agricultural input production	Raw materials production	Field phase	Plant	Packaging	Distribution	Packaging end of life	
Global Warming Potential (GWP)	fossil	kg CO_2 eq	9,01E-03	4,92E-02	3,59E-02	2,06E-03	8,32E-03	5,67E-02	9,43E-05	**1,61E-01**
	biogenic	kg CO_2 eq	5,72E-06	6,07E-05	0,00E+00	2,58E-04	2,17E-05	1,09E-06	4,48E-04	**7,96E-04**
	land use and land use change	kg CO_2 eq	5,44E-06	5,09E-04	0,00E+00	1,24E-07	8,75E-06	1,03E-07	2,39E-09	**5,23E-04**
	TOTAL	kg CO_2 eq	9,03E-03	4,97E-02	3,59E-02	2,32E-03	8,35E-03	5,67E-02	5,43E-04	**1,63E-01**
Acidification potential, AP		kg SO_2 eq	7,48E-05	1,80E-04	7,70E-04	4,02E-06	5,77E-05	3,33E-04	9,23E-07	**1,42E-03**
Eutrophication potential, EP		kg PO_4^{---} eq	1,07E-05	2,97E-05	1,22E-03	8,15E-07	1,11E-05	4,88E-05	5,55E-07	**1,32E-03**
Photochemical oxidation potential, POFP		kg NMVOC eq	4,08E-05	1,33E-04	3,95E-04	4,87E-06	2,90E-05	3,82E-04	1,35E-06	**9,86E-04**
Abiotic impoverishment potential - elements		kg Sb eq	4,22E-07	4,86E-08	0,00E+00	3,01E-10	3,64E-08	1,36E-10	1,91E-12	**5,08E-07**
Abiotic impoverishment potential - fossil fuels		MJ, net calorific value	5,40E-01	1,22E+00	0,00E+00	3,08E-02	2,50E-01	7,39E-01	8,66E-04	**2,78E+00**
Water scarcity		m^3 eq	2,92E+00	1,10E-01	0,00E+00	2,04E-05	4,52E-03	2,65E-01	1,37E-02	**3,31E+00**

The values reported are the result of rounding. That is why the results might be slightly different from the sum of the individual components.

The environmental impacts

USE OF RESOURCE		UNIT OF MEASURE	UPSTREAM		CORE			DOWNSTREAM		TOTAL
			Agricultural input production	Raw materials production	Field phase	Plant	Packaging	Distribution	Packaging end of life	
Renewable energy resources	Use as energy carrier	MJ, net calorific value	2,69E-03	2,16E-01	0,00E+00	1,73E-04	1,90E-02	1,13E-03	5,53E-05	**2,39E-01**
	Use as raw materials	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,11E-02	0,00E+00	0,00E+00	**4,11E-02**
	TOTAL	MJ, net calorific value	2,69E-03	2,16E-01	0,00E+00	1,73E-04	6,00E-02	1,13E-03	5,53E-05	**2,80E-01**
Non renewable energy resources	Use as energy carrier	MJ, net calorific value	5,44E-01	1,31E+00	0,00E+00	7,69E-03	1,33E-01	7,45E-01	1,18E-03	**2,74E+00**
	Use as raw materials	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	2,35E-02	1,43E-01	0,00E+00	0,00E+00	**1,67E-01**
	TOTAL	MJ, net calorific value	5,44E-01	1,31E+00	0,00E+00	3,12E-02	2,77E-01	7,45E-01	1,18E-03	**2,90E+00**
Secondary material		kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**
Renewable secondary fuels		MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**
Non-renewable secondary fuels		MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**
Net use of fresh water		m^3	6,50E-02	2,62E-03	0,00E+00	1,15E-06	1,70E-04	6,20E-03	3,18E-04	**7,43E-02**

The values reported are the result of rounding. That is why the results might be slightly different from the sum of the individual components.

The environmental impacts

WASTE	UNIT OF MEASURE	UPSTREAM		CORE			DOWNSTREAM		TOTAL
		Agricultural input production	Raw materials production	Field phase	Plant	Packaging	Distribution	Packaging end of life	
Hazardous waste disposed	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**
Non-hazardous waste disposed	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**
Radioactive waste disposed	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**

OUTPUT FLOWS	UNIT OF MEASURE	UPSTREAM		CORE			DOWNSTREAM		TOTAL
		Agricultural input production	Raw materials production	Field phase	Plant	Packaging	Distribution	Packaging end of life	
Component for reuse	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**
Material for recycling	kg	1,60E-04	0,00E+00	0,00E+00	6,49E-03	1,23E-04	0,00E+00	1,00E-03	**7,78E-03**
Material for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**
Exported energy, electricity	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,88E-04	**3,88E-04**
Exported energy, thermal	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,11E-04	**8,11E-04**

The values reported are the result of rounding. That is why the results might be slightly different from the sum of the individual components.

The influence of primary packaging

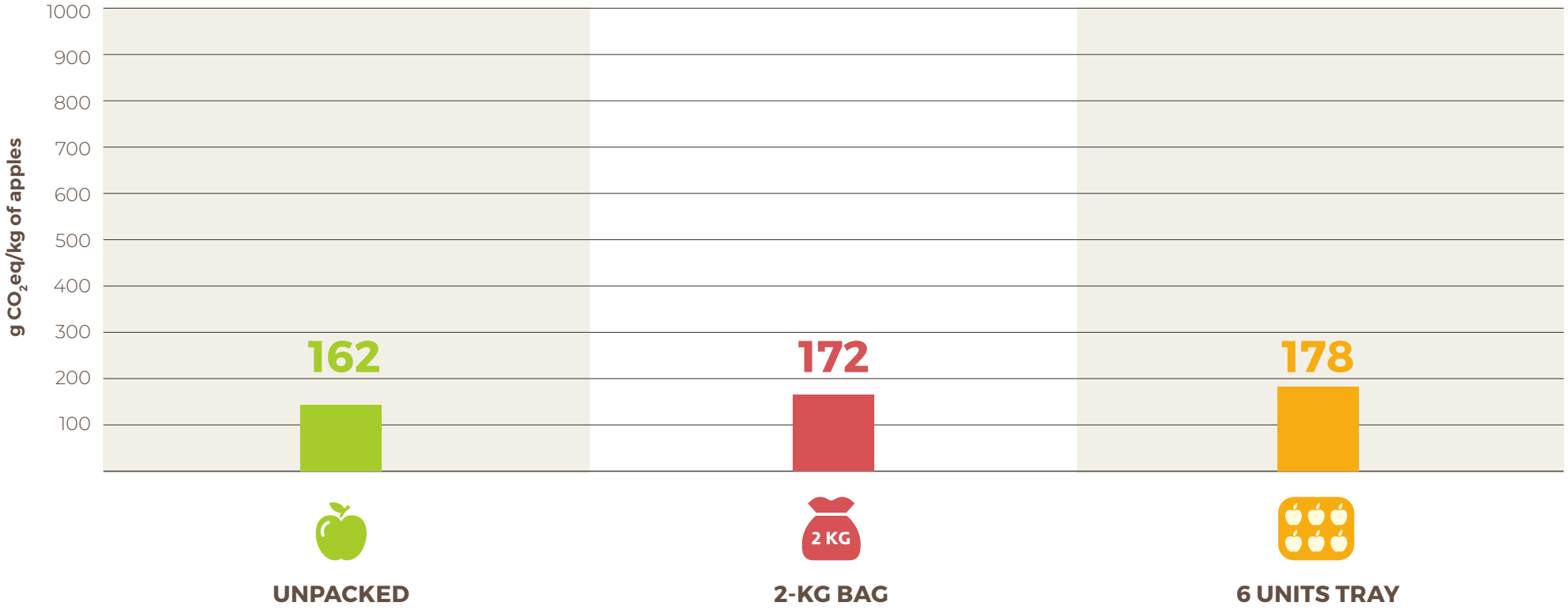
The fossil GWP of 1 kg of apples with three different kinds of packaging has been calculated:

> Unpacked, relating to the selling of loose apples at supermarkets (the use of one biodegradable and compostable bag made per 1 kg of apples has been taken into consideratio);

> A 2-kg bag, relating to the selling of apples in one plastic material bag containing 2 kg of product;

> 6 apples tray, relating to the polystyrene tray with 6 apples.

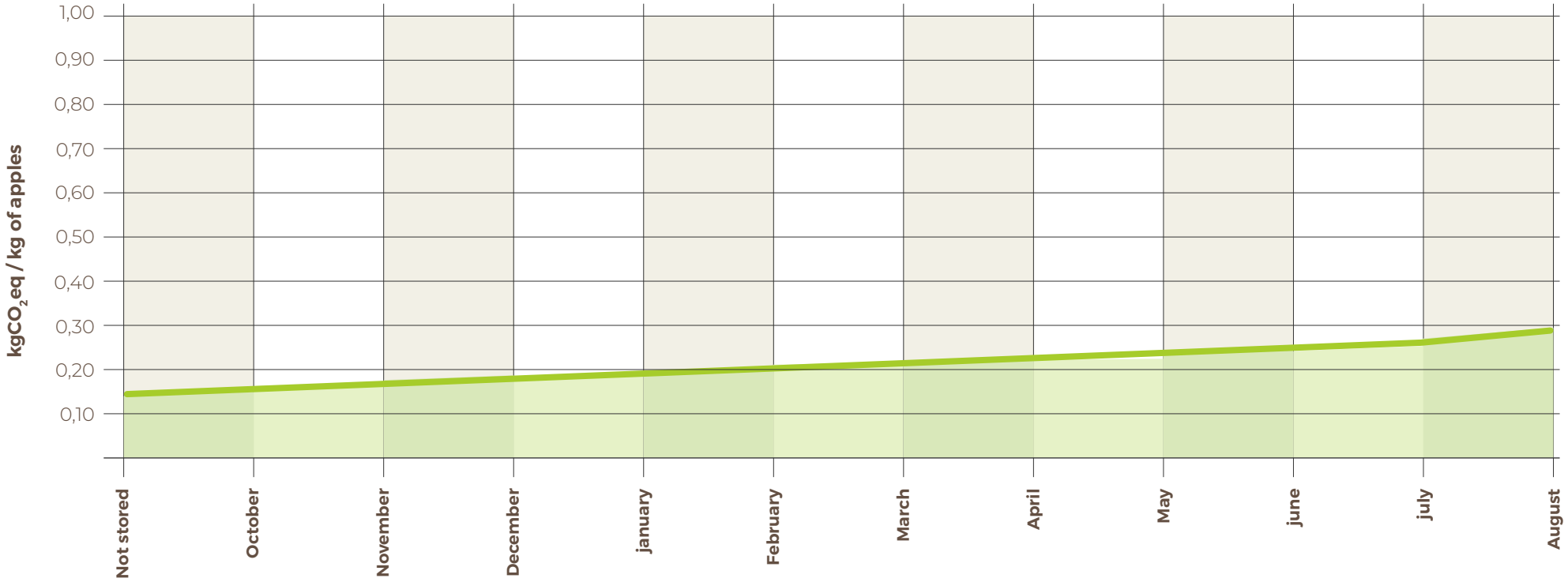
For all three packagings, an average end of life scenario representative of the Italian situation was considered.



The impact over time

Apples are usually harvested between August and November. They are then stocked in a cold environment and marketed within a year. Increasing the storage period, the impacts of the storage phase increases too. For the purpose of the EPD, an **average value** has been declared, calculated by dividing the annual electric energy consumptions by the amount of apples stored altogether.

In the graph below it is reported **the trend of the Cabron Footprint of 1 kg of apples with changing storage site permanence**. The growth turns out to be lower in the first months, when the storage sites are full, and higher in the last months, when the impact relating to the electric energy consumption is divided by the small quantity of apples left.



Information and contacts

REFERENCE

Assomela, as EPD owner, has the sole owership, liability and responsabbility of this EPD.

PROGRAM OPERATOR: EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden info@environdec.com

THIRD PARTY EPD VERIFICATION

Product category rules (PCR)
Fruits and nuts
2019:01
Version 1.0
CPC code: 013 fruits and nuts

PCR review was conducted by:
The Technical Committee of the International EPD® System.
Chair: Filippo Sessa.
Contact via info@environdec.com

Independent verification of the declaration and data, according to ISO 14025:

- ☐ EPD process verification
- ☑ EPD verification - Third party verifier

Procedure for follow-up of data during EPD validity involves third part verifier:

- ☑ Yes
- ☐ No

Third party verifier: Maurizio Fieschi – fieschi@studiofieschi.it www.studiofieschi.it

Approved by: "The International EPD® System Technical Committee, supported by Secretariat

EPDs within the same product category but from different programmes may not be comparable

CONTACTS

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Technical support and grafic design: Life Cycle Engineering srl – Italy www.lcengineering.eu

Glossary and reference

ACIDIFICATION

It is a phenomenon for which precipitation is unusually acidic, meaning that it has substandard levels of pH. It can have harmful effects on plants, aquatic animals and infrastructure. Acid rain is caused by emissions of SO_2, di NOx e di NH_3. The acidification potential is measured in mass of sulfur dioxide equivalent (SO_2-eq).

EUTROPHICATION

It is an abnoral proliferation of vegetation in the aquatic ecosystems caused by the addition of nutrients into rivers, lakes or ocean, which determinates a lack of oxygen. The utrophication potential is mainly influenced by emission into water of phosphates and nitrates. It is expressed in mass of PO_4^{3-} equivalent.

CARBON FOOTPRINT

A product carbon footprint is the total amount of greenhouse gases produced along the entire life cycle. It is expressed in equivalent mass of carbon dioxide (CO_2-eq).

LAND USE CHANGE

The land use change is the change of the destination of use of a soil that modifies its ability to absorb atmospheric CO_2.

PHOTOCHEMICAL OXIDANTS CREATION

Chemical reaction brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight forms the ozone in the troposphere. The indicator is mainly influenced by VOCs (Volatile organic compounds) is usually expressed in mass of non-metallic organic compounds (NMVOC).

REFERENCES

International EPD® System; General Programme Instructions (EPD); Ver 3.0.1 del 2019/09/18

PCR for Fruits and nuts. Version 1.0 of 2019-01-21
CPC code 013 Fruits and nuts

Life Cycle Assessment (LCA) applicata alla filiera di coltivazione e di distribuzione delle mele da parte degli associati in Assomela. Rev.02 of 2020/12/11.

DIFFERENCES COMPARED TO THE PREVIOUS VERSION

The energy mix was updated to 2019.
Some datasets, mainly related to the energy carriers, have been updated to the latest version of Ecoinvent 3.

The calculation of the average

The informations presented refer to **four of the eleven Producer Organizations** associated to Assomela, operating in the regions of Trentino Alto Adige, Piemonte, Lombardia and Veneto. Since the goal of this declaration is to provide information typical of the whole association, the data have been processed in a way that allows to create different averages between the organizations that participate to the project, using weight factors calculated on the basis of production volumes. In detail, the average has been organised in **three different levels**:

• **(M1)** the average between the information relating to all the productive units (UP) referring to a single productive organization (PO) and relating to a specific variety so that it is computable the impact of a single variety produced by a PO. In this level, the data are considered "metadata", and are not subjects of communication;

• **(M2)** the average between the information calculated by single PO and referred to the same variety. This value, calculated by using the single variety production quantity as weighing element, allows to estimate the average impacts of every single variety;

• **(M3)** the total amount of apples produced per variety constitutes the weigh used for calculating the overall average value assigned to Assomela.

AVERAGE	REFERENCE PRODUCT	"OWNER"	DESCRIPTION	COMMUNICATION
M1	Variety	OP	Impact of the variety produced by a single PO	✗
M2	Variety	Assomela	Impact of the variety produced by the Association	✗
M3	Average apple	Assomela	Impact of the apple produced by the Association	✓